PCT / IB 0 3 / 0 1 3 4 8

0 3 APR 2003

INVESTOR IN PEOPLE

REC'D 22 APR 2003
WIPO PCT

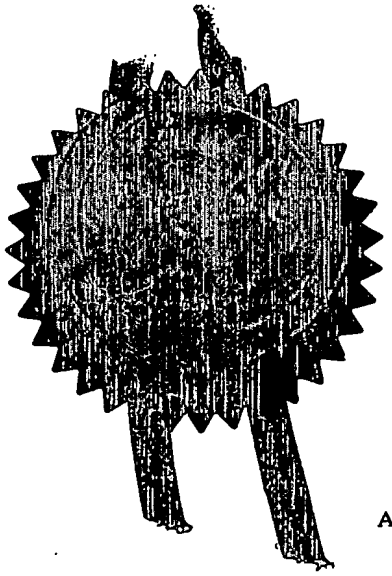
The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.



Signed

Dated 16 January 2003

PRIORITY DOCUMENT
SUBMITTED OR TRANSMITTED IN COMPLIANCE WITH RULE 17.1(a) OR (b)

Pat[illegible]orm 1/77

P[illegible]ct 1977
(s. 16)

The **Patent Office**

THE PATENT OFFICE
00000 L
18 APR 2002
NEWPORT

1/77

Request for grant of a patent
(See notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
Gwent NP10 8QQ

1. Your reference — PHGB020047

2. Patent application number
(The Patent Office will fill in this part) — 0208834.2

18 APR 2002

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

KONINKLIJKE PHILIPS ELECTRONICS N.V.
GROENEWOUDSEWEG 1
5621 BA EINDHOVEN
THE NETHERLANDS

18APR02 E711962-2 D03008
F01/7700 0.00-0208834.2

Patents ADP Number (*if you know it*) 7586605002

If the applicant is a corporate body, give the country/state of its incorporation — THE NETHERLANDS

4. Title of the invention — MULTITRACK OPTICAL DISC READER

5. Name of your agent (*if you have one*)
"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

STEVE TOWNSEND
Philips Intellectual Property and Standards
Cross Oak Lane
Redhill
Surrey RH1 5HA

Patents ADP number (*if you know it*) 8226961001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (*if you know it*) the or each application number

Country	Priority Application number (*if you know it*)	Date of filing (*day/month/year*)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing (*day/month/year*)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (*Answer "Yes" if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form.
Do not count copies of the same document.

Continuation sheets of this form	
Description	4
Claims(s)	1 Done
Abstract	1
Drawings	2 only

10. If you are also filing any of the following, state how many against each item:

Priority Documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (*Patents Form 7/77*)

Request for preliminary examination and search (*Patents Form 9/77*)

Request for substantive examination (*Patents Form 10/77*)

Any other documents (*Please specify*)

11. I/We request the grant of a patent on the basis of this application.

Signature STownsend Date 17/04/02

12. Name and daytime telephone number of person to contact in the United Kingdom 01293 815339 (S. Townsend)

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered "Yes" Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

f) *For details of the fee and ways to pay please contact the Patent Office.*

DESCRIPTION

MULTITRACK OPTICAL DISC READER

This invention relates to a multitrack optical disc reader comprising a multitrack optical pick up for reading data from multiple tracks of an optical disc and outputting the data from each track in respective data streams, and first-in-first-out (FIFO) buffers for temporarily storing data from the respective data streams.

Figure 1 shows, schematically, a conventional optical disc reader 1 comprising a multitrack optical pick up 11 for reading data from five adjacent tracks of an optical disc 10 and outputting the data read from each track in five data streams. Each data stream is fed in to an integrated circuit 12 in which the data streams are combined and the combined data decoded. Specifically, each data stream is fed in to front end (FE) processing circuitry 13 where bit data is recovered and demodulated, and this data is then temporarily stored in a FIFO buffer 14. From the FIFO buffers, the data streams are combined using a multiplexer 17 and the combined data stored in a fast access, SDRAM memory 18 located off-chip. Decoding circuitry 17 located on the integrated circuit retrieves and decodes the combined data stored in the SDRAM memory 18 and feeds the decoded data to an output 20, for example, as a video or audio stream. The FE processing circuitry, FIFO buffers, multiplexer and decoder are all control by a microcontroller (μC) 16 which in turn is controlled by an off-chip central processing unit (CPU) 19.

The temporarily storage of data streams in FIFO buffers enables data to be written from the FIFO buffers to the SDRAM memory in bursts which is necessary if the fast access, SDRAM memory is to be written to efficiently. Unfortunately, hardwired FIFOs buffers substantially increase the gate count of any integrated circuit which contains them, and therefore there is a trade off between using small FIFOs, i.e. a low gate count, and achieving fast memory access.

According to the present invention, a multitrack optical disc reader of the aforementioned type is provided with a memory bank in which the FIFO buffers may be dynamically defined.

Where the disc reader is able to use and is using less than the maximum number of tracks that can be read by the pickup, as is common, the present invention enables at least one of the FIFO buffers to be defined to have a size greater than would otherwise be the case. That is, greater than the total FIFO memory that can be defined in the memory bank divided by the maximum number of tracks that can be read by the pickup. For any given amount of FIFO memory (and associated gate count), larger FIFOs are used and thus larger bursts of data can be subsequently written to fast access memory, thereby increasing the efficiency of the same.

Also, only FIFO buffers for data streams for those tracks used need to be defined and where this is the case, each of the FIFO buffers may be defined to has a size equal to the total FIFO memory divided by the number of tracks being used. That is, the available FIFO memory is shared equally amongst the tracks in use.

The present invention will now be described, by way of example only, with reference to the accompanying schematic drawings in which:

Figure 1 shows, schematically, a conventional multitrack optical disc reader as hereinbefore described;

Figure 2 shows, schematically, a multitrack optical disc reader in accordance with the present invention;

Figure 3 illustrates the mapping of buffered data stored in the conventional disc reader of figure 1 compared to that of the disc reader of the present invention of figure 2.

The same reference signs are used to refer to corresponding or similar features in both the conventional multitrack optical disc reader of figure 1 and the multitrack optical disc reader of figure 2 according to the present invention.

Referring to figure 2, an optical disc reader 1 is shown comprising all the features of the multitrack optical disc reader of figure 1 except that the disc reader is able to use less than the maximum number of tracks that can be read by the pickup. Also, in accordance with the present invention, the FIFO buffers are may be dynamically defined in a common memory bank 21.

For the purposes of illustration, suppose only the inner, outer and middle tracks of the 5 track optical pick up are being used and thus only data from those tracks is being streamed to the integrated circuit 12 where the data streams are combined and the combined data decoded. As two out of 5 tracks are not being used, 3 equally sized FIFO buffers may be defined in the memory bank 21 of a size two thirds greater than would be the case if all five tracks were being used. Therefore, any subsequent data burst transferring data from the FIFO buffers to the fast access, SDRAM memory 18 located off-chip can be two thirds greater, thereby increases the efficiency of this transfer and, with the transfer being under the control of microcontroller (μC) 16, so reducing the load on the CPU 19.

This increase FIFO size is illustrated in figure 3 which maps available FIFO buffered data stored in the conventional disc reader of figure 1 when all 5 tracks (labelled 1 to 5) are in use to that of the disc reader of the present invention of figure 2 when only inner, outer and middle tracks are in use (tracks 1, 3 and 5).

In the above described examples of a conventional multitrack optical disc reader and one in accordance with the present invention, the fast access SDRAM memory is located off-chip though, of course, this could also be another type of memory and / or integrated with the FE circuitry, FIFO buffers, multiplexer and decoder on the integrated circuit.

From reading the present disclosure, other modifications will be apparent to persons skilled in the art. Such modifications may involve other features which are already known in the design and use of multitrack optical disc drives and component parts thereof and which may be used instead of or in addition to features already described herein, and at least including those

features described in US patents 5793549, 5907526, 5959953, 6028827 and 6216201.

CLAIMS

1. A multitrack optical disc reader comprising a multitrack optical pick up for reading data from multiple tracks of an optical disc and outputting the data from each track in respective data streams; and a memory bank in which first-in-first-out (FIFO) buffers for temporarily storing data from the respective data streams may be dynamically defined.

2. A disc reader according to claim 1 which is able to use less than the maximum number of tracks that can be read by the pickup.

3. A disc reader according to claim 2 wherein, when less than the maximum possible number of tracks that can be read by the pickup are being used, at least one of the FIFO buffers is defined to have a size greater than the total FIFO memory that can be defined in the memory bank divided by the maximum number of tracks that can be read by the pickup.

4. A disc reader according to claim 2 or claim 3 wherein, when less than the maximum possible number of tracks that can be read by the pickup are being used, only FIFO buffers for data streams for those tracks used are defined.

5. A disc reader according to claim 4 wherein each of the FIFO buffers defined has a size equal to the total FIFO memory that can be defined in the memory bank divided by the number of tracks being used.

ABSTRACT

MULTITRACK OPTICAL DISC READER

A multitrack optical disc reader is disclosed comprising a multitrack optical pick up for reading data from multiple tracks of an optical disc and outputting the data from each track in respective data streams, and multiple first-in-first-out (FIFO) memories for temporarily storing the data streams. In accordance with the present invention, wherein the pickup may selectively output data streams from less than the maximum number of tracks that can be read by the pickup, the multiple FIFO memories are provided in a common memory bank, and when less than the maximum number of tracks are being read by the pickup, the size of at least one FIFO memory in use is greater than the total available FIFO memory in the common memory bank divided by the maximum number of tracks that can be read by the pickup.

[figure 2]

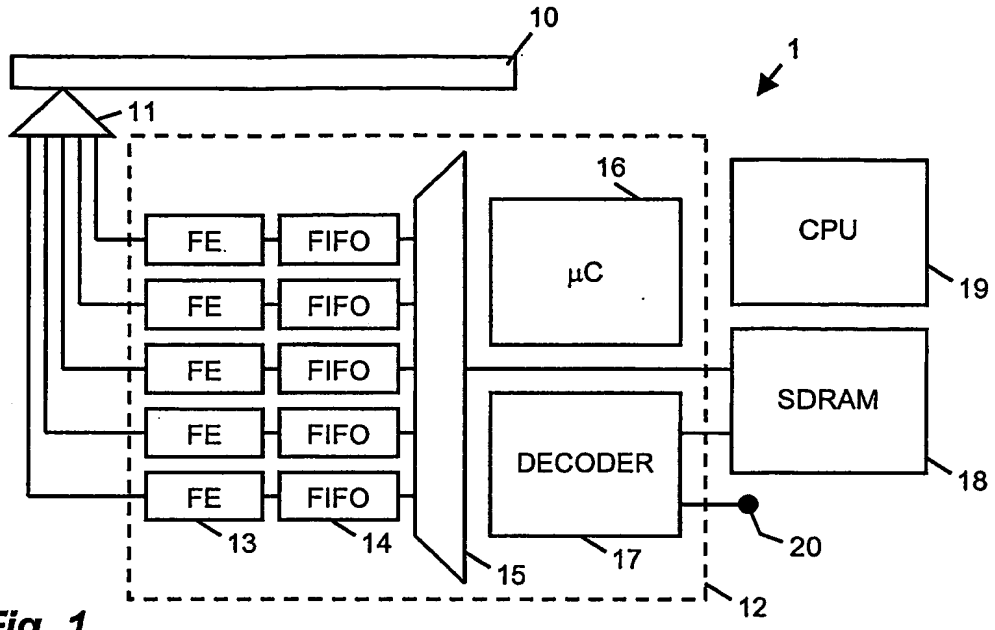

10
1
11
16
FE
FIFO
µC
CPU
19
FE
FIFO
FE
FIFO
SDRAM
FE
FIFO
DECODER
18
FE
FIFO
20
13
14
15
17
12

Fig. 1

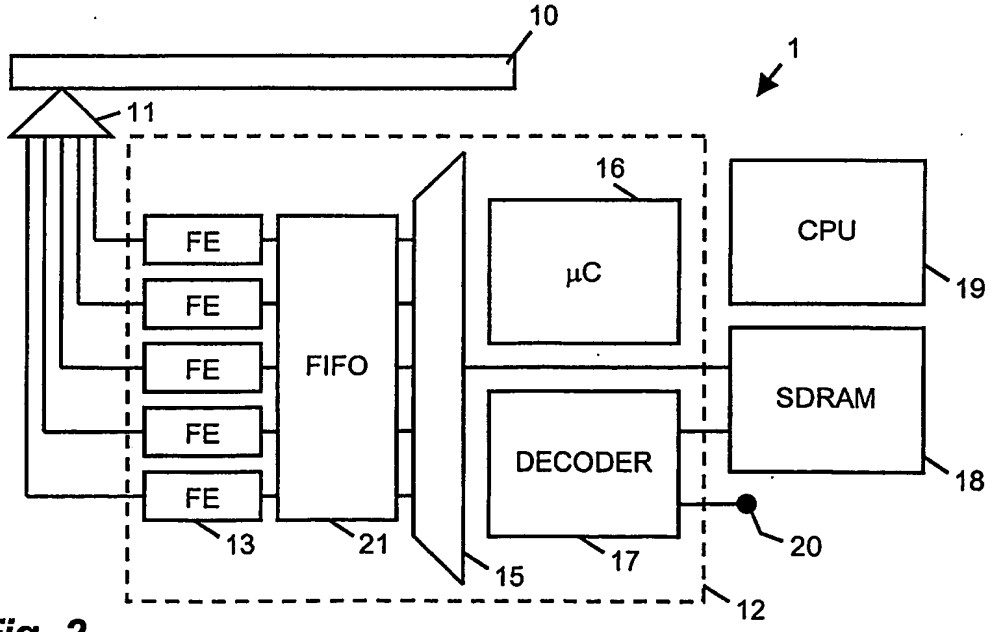

10
1
11
16
FE
µC
CPU
19
FE
FE
FIFO
SDRAM
FE
DECODER
18
FE
20
13
21
15
17
12

Fig. 2

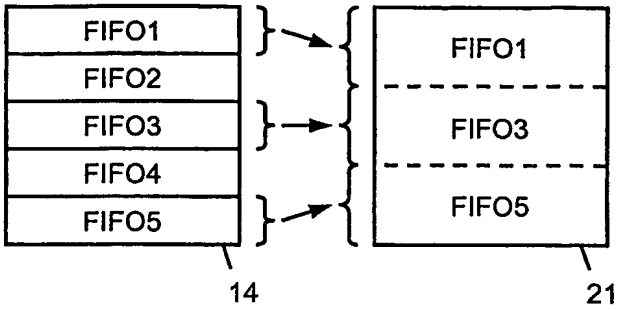


Fig. 3